

A New Species of *Adontorhina* (Bivalvia: Thyasiridae) from the Northeast Pacific, with Notes on *Adontorhina cyclia* Berry, 1947

by

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Abstract. A minute bivalve, *Adontorhina sphaericosa* Scott, spec. nov. (Thyasiridae), is described from Boca de Quadra, Alaska. The new species occurs from 95 to 330 m in two fjords in southeast Alaska, at 165 m in British Columbia, and from 204 to 458 m on the continental slope of Oregon. The morphologic relationship and familial placement of three thyasirids, *Adontorhina*, *Axinulus*, and *Leptaxinus*, are discussed. Diagnostic characters separating these three genera are proposed and illustrations of the primary type specimens are included. A revised description and new records of *Adontorhina cyclia* Berry, 1947, are reported, including a major northern range extension to the Bering Sea, Alaska. The gross anatomy for both species of *Adontorhina* is described and illustrated.

INTRODUCTION

WHILE INVESTIGATING the mollusks of the Boca de Quadra fjord, Alaska, a new thyasirid was discovered. Subsequent study of material from British Columbia and the continental slope of Oregon yielded the same species. Generic placement proved difficult due to the paucity of literature on the three minute thyasirid genera *Adontorhina* Berry, 1947, *Axinulus* Verrill & Bush, 1898, and *Leptaxinus* Verrill & Bush, 1898. All species in the genera have small, white shells with poorly developed dentition. The previously published accounts do not elucidate the differences between these conchologically similar genera. Examination of the primary type material was illuminating, with the new species belonging to *Adontorhina*. The new species of *Adontorhina* is here described and an expanded description of *A. cyclia* Berry, 1947, is provided, along with new distributional and habitat records.

CONVENTIONS AND ABBREVIATIONS

The following treatment includes a description of the two species of *Adontorhina*, with information on type specimens and localities, and notes on distribution and habitat. All taxonomic references are listed in the bibliography.

The following are abbreviations of institutions used in the text: CAS, California Academy of Sciences; LACM, Los Angeles County Museum of Natural History; MCZ,

Museum of Comparative Zoology; NMC, National Museum of Canada; SBMNH, Santa Barbara Museum of Natural History; SDNHM, San Diego Natural History Museum; USNM, United States National Museum of Natural History.

TAXONOMIC ACCOUNT

Family THYASIRIDAE Dall, 1901

Subfamily AXINOPSINAE Bernard, 1983

Adontorhina Berry, 1947

(Type species: *Adontorhina cyclia* Berry, 1947; by original designation)

Shell small, fragile, orbiculoid to spheroid; beaks prosogyrous and moderately prominent; periostracum thin, adherent, silky to highly polished; ligament internal, resting on a narrow shelf posterior to the beaks; hinge plate narrow to moderately wide, composed of two sections, one section extending anterior to the beaks, the other section located centrally along the posterodorsal margin; without true teeth but with minute granules along the hinge plates that intermesh much like mammalian molars, granules varying between specimens from weakly to strongly expressed; pallial line entire [emended BERRY, 1947:260].

The systematic relationships of *Adontorhina* have been questioned by some investigators. BERRY (1947) was un-

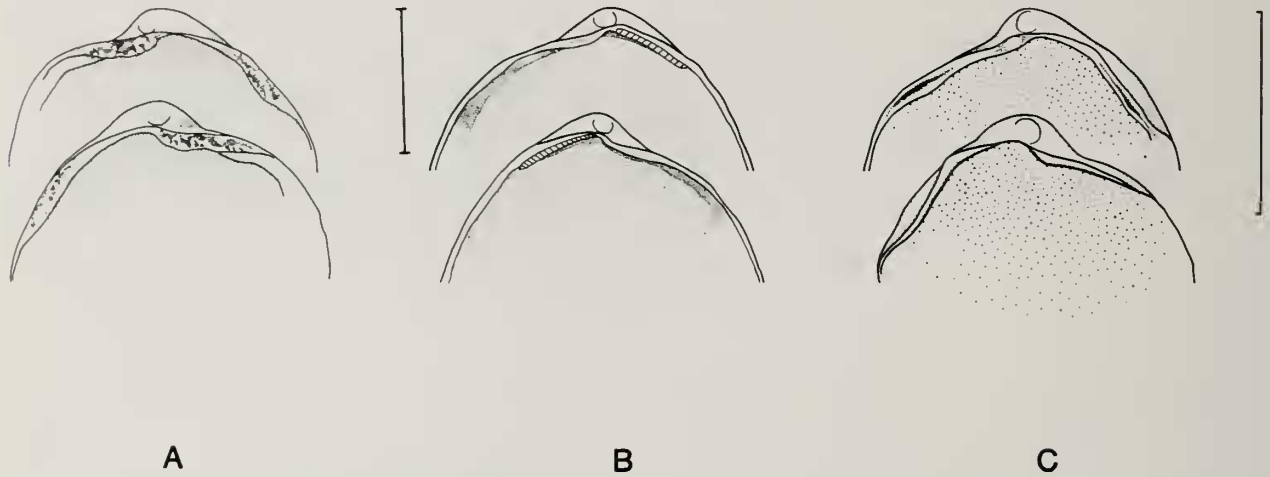


Figure 1

Hinge plates of minute thyasirids. A. *Adontorhina cyclia*, paratype, MCZ 165903. B. *Axinulus brevis*, holotype, USNM 159873. C. *Leptaxinus minutus*, holotype, USNM 45686. Scale bars = 1 mm.

certain about his placement of *Adontorhina* into the family Thyasiridae. *Adontorhina cyclia* was described from the Lower Pleistocene ("Hilltop Quarry," San Pedro, California) and the lack of soft parts and the unusual hinge may have caused the confusion. HERTLEIN & GRANT (1972) considered that the granular hinge plate and the lack of a radial sulcus precluded placement in the Thyasiridae. My recent inspection of the soft parts of *Adontorhina cyclia* and *Adontorhina sphaericosa* further adds to the uncertainty. While the two species have arborescent digestive glands characteristic of Thyasiridae (ALLEN, 1958; BERNARD, 1972, 1979), they have only a single demibranch per ctenidium, a character of the Lucinidae (ALLEN, 1958). Inspection of the ctenidia of *Axinulus careyi* Bernard, 1979, also showed a single demibranch, as well as a lucinid "heel" on the foot. I am continuing to study the anatomy of minute "thyasirids" in order to further define family characters. Until such a study is complete, I feel *Adontorhina* and *Axinulus* are best retained in the Thyasiridae.

A thorough treatment of the minute thyasirid genera has not been published in this century. *Adontorhina*, *Axinulus*, and *Leptaxinus* all have small fragile shells with a weakly expressed hinge. DALL (1901) included a cursory comment on *Leptaxinus*, "shell like *Axinulus*, but with distinct lateral teeth." He placed *Axinulus* as a subgenus of *Thyasira* Lamarck, 1818, "with the dorsal areas obsolete" (DALL, 1901). A relationship between *Adontorhina* and *Axinulus* is alluded to by KEEN & COAN (1974). BERNARD (1979) mentioned the difficulty in separating *Axinulus* and *Leptaxinus*, and considered *Axinulus careyi* as intermediate between these two genera. CHAVAN (1969) discussed all three genera but did not give diagnostic characters to easily separate them.

Although a complete revision of these genera is not within the scope of this paper, examination of type material of the type species of the three genera yielded the following distinctions. *Adontorhina cyclia* Berry, 1947, has a narrow to broad hinge plate with a unique granular appearance. Anteriorly, the hinge granules are distinct, and weakly to moderately expressed posteriorly (Figure 1A). *Axinulus brevis* Verrill & Bush, 1898, has a narrow hinge plate that is smooth and edentulous (Figure 1B), although a minute hinge tubercle beneath the beak may be present in some species of *Axinulus*. The hinge plate of *Leptaxinus minutus* Verrill & Bush, 1898, is narrow but not simple; the right valve has a small tubercle beneath the beak, which fits into a corresponding notch in the left valve. The right valve also has long anterior and posterior lateral grooves into which the dorsal shell margin of the left valve is seated (Figure 1C).

Adontorhina sphaericosa Scott, spec. nov.

(Figures 2-5, 9A, 12, 13)

Description: Exterior: Shell small (<2 mm), thin, fragile, white to transparent, highly inflated; periostracum thin, adherent, highly polished; surface smooth except for low irregular incremental growth striae visible under high magnification; beaks central, inflated, slightly prosogyrate; lunule weakly expressed, not demarcated by a line or ridge; escutcheon wide, deep, well defined, extending from beaks to posterodorsal margin; outline suborbiculate, anteroventral margin slightly drawn out; strongly adherent red-brown mud present along the anterior and posterior dorsal margins of many specimens.

Interior: Hinge plate narrow to moderately wide, edentulous with irregular granules; hinge plate with two dis-

tinct sections: (1) an anterior plate extending from just posterior of the beaks to three-fourths of the way to the anterior margin, and (2) a posterior plate centrally located along the posterodorsal margin not extending to beaks or posterior margin; ligament internal, long, narrow, reddish-brown, extending from the anterior hinge plate to the posterior hinge plate; adductor muscle scars moderately to weakly impressed, ovate, sub-equal in size; pallial line entire, thin, moderately to weakly impressed.

Gross anatomy: Mantle thin, transparent, margins thickened; mantle fusion limited to a small section ventral to the single posterior opening; anterior adductor muscle large, elongate, ventral edge slightly curved inward of the mantle margin; posterior adductor muscle very small, sub-ovate, continuous with mantle margin; foot elongate, vermiform, with bulbous distal section; each ctenidium consisting of a single demibranch; mouth very large; labial palps of moderate size for family; digestive gland and gonadal tissue forming a single mass of arborescent tufts; rectum located dorsally between the ctenidia, visible only in dorsal view, extending from beaks to the posterior adductor muscle; renal tissue ventral of rectum between the ctenidia, with distinct concretions.

Type locality: Boca de Quadra fjord, southeast Alaska, 55°10.2'N, 130°37.5'W, 280 m depth, in 90% silt and clay, Coll. Robert Cimberg, September 1981.

Type measurements (mm) and deposition:

| | Length | Height | Width (sv = single valve) | Depository |
|-----------|--------|--------|---------------------------------|-------------|
| Holotype | 1.6 | 1.6 | 1.3 | SBMNH 33911 |
| Paratypes | 1.5 | 1.5 | 1.2 | SBMNH 33910 |
| | 1.2 | 1.2 | 0.9 | SBMNH 33910 |
| | 1.6 | 1.6 | 1.2 | SBMNH 33910 |
| | 1.3 | 1.3 | 0.6 (sv) | SBMNH 33910 |
| | 1.4 | 1.4 | 0.6 (sv) | SBMNH 33910 |
| | 1.5 | 1.5 | 0.7 (sv) | SBMNH 33910 |
| | 1.3 | 1.3 | 0.6 (sv) | SBMNH 33910 |
| | 1.4 | 1.4 | 0.7 (sv) | SBMNH 33910 |
| | 1.4 | 1.4 | 0.6 (sv) | SBMNH 33910 |
| | 1.3 | 1.3 | 0.6 (sv) | SBMNH 33910 |
| Paratypes | 1.4 | 1.5 | 1.2 | CAS 057048 |
| | 1.5 | 1.5 | 1.2 | CAS 057048 |
| | 1.4 | 1.3 | 1.0 | CAS 057048 |
| Paratypes | 1.6 | 1.6 | 1.2 | LACM 2087 |
| | 1.5 | 1.5 | 1.3 | LACM 2087 |
| | 1.4 | 1.4 | 1.1 | LACM 2087 |
| Paratypes | 1.5 | 1.5 | 1.1 | NMC 92606 |
| | 1.5 | 1.6 | 1.2 | NMC 92606 |
| | 1.5 | 1.5 | 1.1 | NMC 92606 |
| Paratypes | 1.4 | 1.4 | 1.0 | USNM 847155 |
| | 1.5 | 1.6 | 1.3 | USNM 847155 |
| | 1.4 | 1.4 | 1.1 | USNM 847155 |

Etymology: The specific name is derived from the Greek

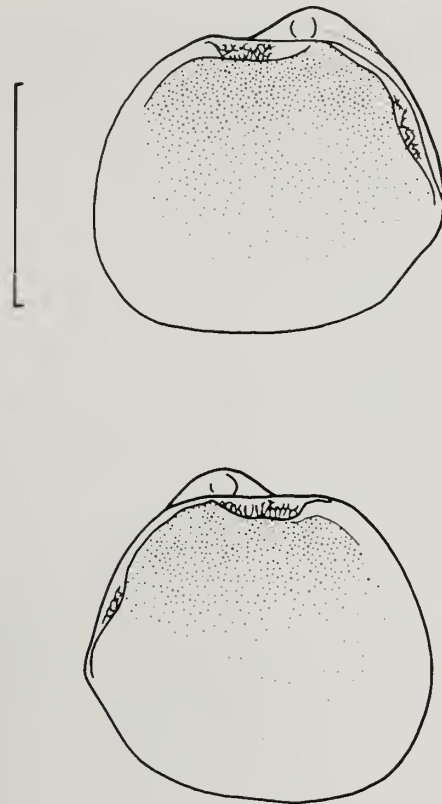


Figure 2

Internal view of left and right valves of *Adontorhina sphaericosa* Scott, holotype, SBMNH 33911, Boca de Quadra, Alaska. Scale bar = 1 mm.

sphairikos, referring to the inflated, spheroid shape of the shell.

Material examined: 65 lots from Alaska, 1 lot from British Columbia, 14 lots from Oregon; approximately 350 total specimens.

Distribution and habitat: Smeaton Bay, Alaska (55°18.5'N, 130°45.8'W, SBMNH 34041); Boca de Quadra, Alaska (55°10.2'N, 130°37.5'W, SBMNH 34042); British Columbia, Canada (48°43.8'N, 123°20.5'W, SBMNH 34043); and off Newport, Oregon (43°48.7'N, 124°50.5'W, SBMNH 34044). *Adontorhina sphaericosa* has yet to be found off Washington although the species probably occurs there. Lack of sampling at the proper depth or damage of this fragile species during collection or processing may account for the absence of specimens. Known depth distribution is from 95 to 330 m in Alaska, 165 m in British Columbia, and from 204 to 458 m in Oregon. *Adontorhina sphaericosa* has been found only in fine sediments ranging from 81 to 95% silt and clay. Bottom temperatures at stations where the species



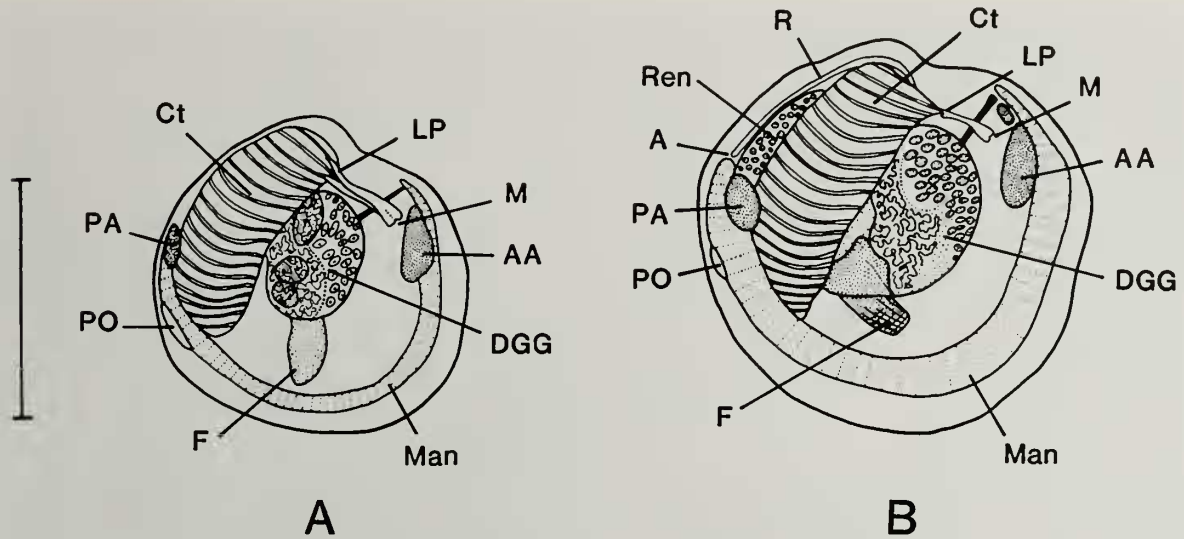


Figure 9

Gross anatomy. A. *Adontorhina sphaericosa*, SBMNH 34040, Boca de Quadra, Alaska. B. *Adontorhina cyclia*, SBMNH 34039, off Coos Bay, Oregon. Key: A, anus; AA, anterior adductor muscle; Ct, ctenidium; DGG, digestive gland-gonad; F, foot; LP, labial palps; M, mouth; Man, mantle; PA, posterior adductor muscle; PO, posterior opening; R, rectum; Ren, renal tissue. Scale bar = 1 mm.

was found ranged from 4° to 7°C in Alaska (VTN, 1980, 1981) and from 5° to 7.5°C in Oregon waters (R. E. Ruff, personal communication, 1984).

Comparison: *Adontorhina sphaericosa* is easily differentiated from *A. cyclia* by the well-defined escutcheon and the extreme inflation of the valves of the former species. Juvenile specimens of *A. sphaericosa* are less inflated than adults but do exhibit a distinct escutcheon.

Adontorhina cyclia Berry, 1947

(Figures 1A, 9B, 6-11)

BERRY, 1947:260-261, plate 1, figures 1, 2; HOWARD, 1952: 5; JONES, 1965:127-141, figure 1; HERTLEIN & GRANT, 1972:254; BERNARD, 1983:30.

Description (expanded BERRY, 1947): Exterior: Shell

small (<3 mm), thin, fragile, white to transparent; moderately inflated; periostracum thin, adherent, silky to shiny; surface smooth except for incremental striae visible under high magnification; beaks slightly anterior of center, moderately inflated, slightly prosogyrate; lunule weakly expressed, not demarcated by a line or ridge; escutcheon faintly impressed, visible only under high magnification; anterodorsal margin almost straight, perpendicular to beaks; posterodorsal margin straight to gently curved; in some specimens, a very slight radial undulation extending from posterior of beaks to posterior margin; strongly adherent red-brown mud present along the anterior and dorsal margins of many specimens.

Interior: Hinge plate narrow to moderately wide, edentulous with irregular granules weakly to strongly expressed; hinge plate composed of two sections: (1) an anterior plate of variable length extending from under beaks

Explanation of Figures 3 to 8

Figures 3-5. Scanning electron micrographs of three specimens of *Adontorhina sphaericosa* from southeast Alaska.

Figure 3. External view of left valve, Boca de Quadra, Alaska; length = 1.55 mm, height = 1.53 mm.

Figure 4. Internal view of right valve, Boca de Quadra, Alaska; length = 1.50 mm, height = 1.70 mm.

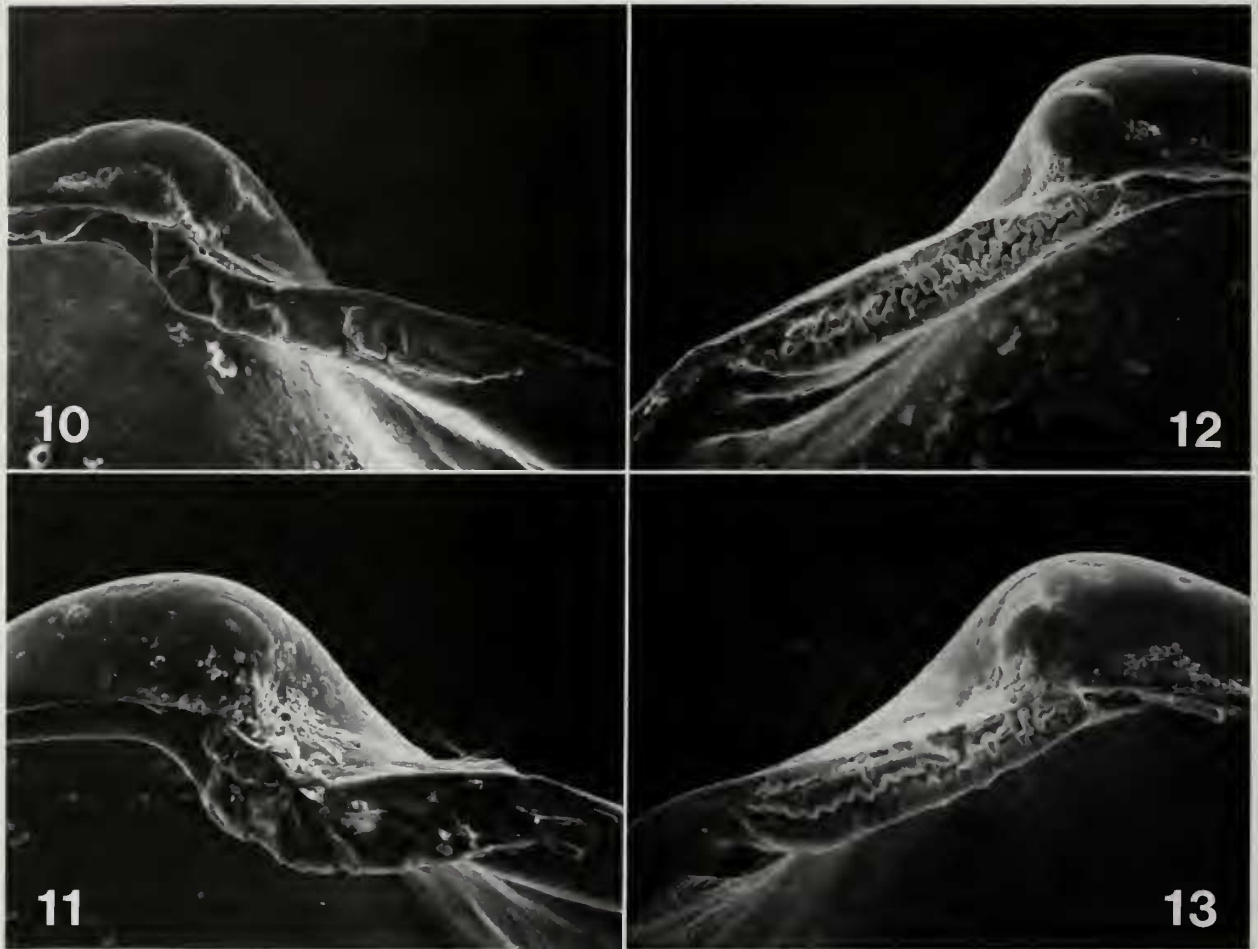
Figure 5. Dorsal view of both valves, Smeaton Bay, Alaska; length = 1.73 mm.

Figures 6-8. Scanning electron micrographs of three specimens of *Adontorhina cyclia* Berry, 1947, from southeast Alaska.

Figure 6. External view of right valve, Smeaton Bay, Alaska; length = 2.05 mm, height = 2.07 mm.

Figure 7. Internal view of right valve, Smeaton Bay, Alaska; length = 1.80 mm, height = 1.87 mm.

Figure 8. Dorsal view of both valves, Smeaton Bay, Alaska; length = 2.00 mm.



Explanation of Figures 10 to 13

Scanning electron micrographs showing details of the anterior hinge plates of *Adontorhina* from Alaska and Oregon.

Figure 10. Left valve of *Adontorhina cyclia*, off Coos Bay, Oregon; 120 \times . Note narrow, obscure hinge plate.

Figure 11. Left valve of *Adontorhina cyclia*, Smeaton Bay, Alaska; 120 \times . Note wide, thickened hinge plate.

Figure 12. Right valve of *Adontorhina sphaericosa*, Boca de Quadra, Alaska; 90 \times . Note fine hinge granules.

Figure 13. Right valve of *Adontorhina sphaericosa*, Boca de Quadra, Alaska; 90 \times . Note long, heavy, lamellar hinge plate.

to anywhere from one-fourth to three-fourths of the way to the anterodorsal margin, (2) a posterior plate weakly defined to obscure, when present centrally located along the posterodorsal margin, granules obscure on posterior plate; ligament internal, long, narrow, extending between anterior hinge plate and posterior hinge plate; adductor scars weakly impressed, ovate/elongate, subequal in size; pallial line thin, entire, weakly impressed.

Gross anatomy: Mantle thin, transparent, margins thickened; mantle fusion limited to a small region ventral to the single posterior opening; anterior adductor muscle large, elongate, ventrally curved inward from the mantle margin; posterior adductor muscle small, subovate, con-

tinuous with mantle margin; foot elongate, vermiform, without bulbous distal section; each ctenidium consisting of a single demibranch; mouth large; labial palps very reduced; digestive gland and gonadal tissue forming a single mass of arborescent tufts; rectum dorsal to the ctenidia, extending posteriorly from the beaks and curving along the dorsal margin; anus slightly dorsal of posterior adductor muscle; renal tissue directly ventral of the rectum, with distinct concretions.

Material examined: Holotype, 4 paratype lots; 1 lot from Mexico; 17 lots from California, including 4 lots from San Pedro Pleistocene; 50 lots from Oregon; 136 lots from Alaska; approximately 2300 total specimens.

Type locality: Lower Pleistocene, "Hilltop Quarry," San Pedro, Los Angeles County, California (33°45.3'N, 118°18.3'W).

Location of type material: Holotype: CAS 61460, 1 left valve (from Stanford Univ. Paleo. Type Coll. LSJU 7865, ex S. S. Berry Coll. 10404). Paratypes: SBMNH 34033 (from S. S. Berry Coll. 10405); USNM Paleontology 560376; CAS 044002 (from Stanford Univ. Paleo. Type Coll. LSJU 7865); SDNHM Paleontology 320, 321, 0639, 04312 and 04313 (each valve in lot given a separate number); MCZ 16590; no paratypes were deposited at the Paleontological Research Institute (P. Hoover, personal communication) or California Institute of Technology (G. Kennedy, personal communication) contrary to BERRY (1947); paratype deposited in E. P. Chace collection not found.

Distribution and habitat: Bering Sea, Alaska (58°36.0'N, 174°56.0'W, LACM 60-26.27) to Guadalupe Island, Baja California, Mexico (29°09'N, 118°17'W, LACM 51-44), one live specimen was also collected in the Gulf of California off Bahia de Los Angeles, Baja California, Mexico (28°53'40"N, 113°32'45"W, LACM 36-53). Depth distribution in southern California is from 11.6 to 1886 m (JONES, 1965; JONES & THOMPSON, in press). *Adontorhina cyclia* has been collected from 36 to 116 m in Oregon and from 22 to 330 m in Alaska. The records from northern waters are not as extensive as the southern California data in JONES (1965). The depth range in the northern localities may be considerably expanded when additional samples are collected and identified. As expected by a species with a broad depth distribution, *A. cyclia* is able to live in a variety of sediments. JONES (1965) reports the species in sand to clayey silt with the highest densities at 40–60% silt and clay. Bottom temperatures at depths less than 600 m range from 9.3 to 15.4°C in southern California (JONES, 1965), 7.9° to 8.9°C in Oregon (R. E. Ruff, personal communication, 1984), and 5° to 7°C in Alaska (VTN, 1980, 1981).

An additional fossil locality is Timms Point, San Pedro, Los Angeles County, California (LACM Invert. Paleo. 130-6 and 130-7) in Timms Point Silt; Pleistocene.

DISCUSSION

Although *Adontorhina cyclia* is a common component of the infauna at continental shelf and slope depths from Oregon to Alaska, this is the first report of the species from these regions. It is probable that the species has been confused with the juveniles of the numerically dominant *Axinopsida serricata* (Carpenter, 1864). Externally the two species are superficially similar, each being small, white, fragile and orbicular. However, *Adontorhina cyclia* is more inflated and exhibits a nearly straight anterodorsal margin. Internally the hinge structure is completely different, with *Adontorhina cyclia* possessing an edentulous, granular hinge plate, and with *Axinopsida serricata* having a distinct

pseudocardinal tooth in the right valve and a corresponding pit in the left valve.

Adontorhina sphaericosa and *Adontorhina cyclia* occurred together at 16 stations in southeast Alaska. Both species were found at 7 stations in Boca de Quadra fjord in depths from 95 to 330 m, and at 9 stations in Smeaton Bay in depths from 148 to 265 m. Densities were approximately 20/m² for each species at these stations. Other common thyasirid species at these stations include *Axinopsida serricata* (Carpenter, 1864) and *Thyasira gouldii* (Philippi, 1845).

The hinge plate of both species of *Adontorhina* is exceedingly variable. Specimens of *A. cyclia* can vary from having a narrow, obscure anterior plate (Figure 10) to a moderately wide, thickened anterior plate (Figure 11). The "granules" of *A. sphaericosa* vary greatly among specimens. They can be very numerous and small (Figure 12) or coalesced into long lamellar plates (Figure 13). In all specimens of *Adontorhina* I have observed, no two hinge plates exhibited the same granule pattern. The unique qualities of the hinge granules of each specimen is indeed very reminiscent of the individual variations in human fingerprints.

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